PRE-OPERATIVE EXAMINATION*

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To the physician, in the smaller communities at least, come for examination prospective patients of surgical colleagues. A goodly portion of these appear without the knowledge of the surgeon and without informing the physician of their previous surgical advice. They desire to know whether an operation is indicated, how much benefit is apt to result and how much risk they run of dying. The physician, although having no advantage over the surgeon in answering the first and second, should perhaps be qualified to give a more adequate estimate as regards the third question.

F. W. Birtch, in discussing the 1914-15 reports of the Massachusetts General Hospital's post-operative deaths in chronic surgical condition, says that in one-third death was due "to the lack of pre-operative diagnostic skill to ascertain reserve power of other organs, or extent of primary disease or number and influence of concomitant disease." He advocated the intensive group study of all chronic cases and reported results of a series at St. Luke's Hospital, San Francisco. This study did not stress surgical risk or endeavor to put it upon a mathematical basis. Others have laid emphasis upon the blood pressure as a criterion for estimating operative risk.

Miller published a study of one thousand patients classified according to the rule promulgated by Moots: "When the pulse pressure divided by the diastolic pressure (PP/DP) is greater that 75 per cent or less than 25 per cent, patient is probably inoperable," which rule Miller praises as having been useful to him.

For some years it has been our custom to refer very ill or handicapped surgical patients for medical appraisement before operation. Until the last two years we had made no systematic effort to find out how much danger was involved in an ordinary surgical procedure and what findings were to be looked upon as of more sinister significance in evaluating operative risk.

In this study, patients to be operated upon were given an ordinary clinical examination and an effort made to express in per cent the result. Record was made of sex; age; haemoglobin; blood pressure (systolic, diastolic, and pulse); heart (size, rate, rhythm and valves); lung and urinary findings. A number indicating the clinical estimate of the status of the patient was set down on the chart. At first we tried to make this number proportionate to the published percentage death rate for the various operative procedures. This proved unworkable because of the physician's frequent unfamiliarity with this method. The number set down then represented the estimated vitality of each individual, a normal being 100 per cent. After the patient had left the hospital, the charts upon which the anesthetic, surgical procedure, operative behavior, and post-operative course had now been entered were summed up. Sex and age were found of no significance and excluded; sex having no bearing at all and the matter of age being adequately covered by clinical findings. Temperature in itself was found to have little bearing, those patients with fever being judged upon other grounds. The pulse rate varied from 52-130. Except in two heart failure cases, the rate depended obviously upon fever, goiter, or neurosis. Urine examination was made in all cases. This did not prove very helpful; we had no patients suffering from diabetes or parenchymatous nephritis. Where albumin or casts were found, acute inflammation elsewhere with fever accounted for these findings in the low blood pressure cases; or the circulatory status, blood pressure particularly, served as an index to the amount of disability present.

There were 325 patients examined in which operation was postponed in 9 (3 per cent), 2 because of acute heart failure and 7 because of acute chest conditions. Three hundred and sixteen patients were operated upon. Mortality, 7 or 2.2 per cent. Two of pneumonia, both after excision of a ruptured appendix; two of peritonitis, one from a gangrenous ovarian cyst, and one from soiling in the excision of a cancer of the rectum; one of hemorrhage in a myomectomy; one of empyema of gall bladder; one of Addison's disease after incision of a large lumbar abscess. These may be classified somewhat according to the Massachusetts plan as:

1. Surgical failure, 2 (28 per cent), i. e., the hemorrhage and one peritonitis due to soiling.
2. Poor medical judgment (14 per cent), i. e., the Addison's disease.
3. Surgical calamity, 2 (28 per cent), i. e., the pneumonias.
4. Unavoidable because of condition present, 2 (28 per cent), i. e., one peritonitis (gangrenous cyst), and one toxemia (gall bladder).

This classification however, gives a very inaccurate picture of the problem. Five of these seven patients were operated upon for the drainage of pus and are therefore to be classed as emergency surgery. They are included here only because they were "estimated" before operation. The death rate thus appeared to shed small light upon the adequacy of the pre-operative method of estimating risk.

Post-operative disturbances of circulation and lungs gave more interesting results when compared with the protocol from the antecedent examination. The number and nature of pre-operative abnormalities with post-operative disturbances follow:

Heart pre-operative findings—Normal, 219 (69 per cent); abnormal, 97 (31 per cent); abnormalities included increase in size, 78 (25 per cent); arrhythmias, 13 (4 per cent); sinus, 10; extrasystoles, 3; murmurs, 38 (12 per cent); diastolic, 4; systolic, 34 (of these, 15 were thought inconsequential).

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Post-operative circulatory disturbances were noted fifty-one times (16 per cent). These were found to be distributed as follows: (a) With normal sized heart 16 per cent; enlarged heart 19 per cent. (b) With regular heart 48 (15 per cent); irregular heart 24 per cent. (c) With normal sounds (16 per cent); with murmurs (18 per cent).

Thus the heart abnormalities, though considerable in number, produced very little effect upon post-operative course.

Lungs were normal 237 times (75 per cent); abnormal 79 times (25 per cent). These abnormalities were divided clinically into fibroid apex, 24 (30 per cent); active tuberculosis, 8 (10 per cent); bronchitis, 21 (29 per cent); emphysema, 25 (31 per cent); basal dullness, 1.

Post-operative disturbances of the lungs were noted 44 times (14 per cent). Of the 237 normals, 19 (8 per cent), showed some pathological changes in the lungs; bronchitis in 13 (6 per cent); pneumonia in 3 (1 per cent); pleurisy in 3 (1 per cent). Of the seventy-nine with abnormalities of the lungs, 25 (37 per cent), developed post-operative disturbances. These were bronchitis, 18 (23 per cent); pneumonia, 7 (9 per cent).

Distributed among the four groups we find: Fibroid apex was followed by bronchitis 8 per cent, pneumonia 4 per cent; pulmonary tuberculosis by bronchitis 0, pneumonia 12 per cent; bronchitis by bronchitis 33 per cent, pneumonia 14 per cent; emphysema by bronchitis 36 per cent, pneumonia 4 per cent; basal dullness by bronchitis 0, pneumonia 100 per cent.

Thus, although lung abnormalities were found in less number than those of the heart, post-operative events attach to them a graver significance. Bronchitis and emphysema seemed especially apt to cause trouble. The proportion of lung disturbances in those showing even slight abnormalities was over four and one-half times as great as among those with normal lungs.

Blood Pressure—Systolic varied from 62-210; arbitrarily divided into 3 groups: 141-210, mm Hg, 30 (10 per cent); 91-140, mm Hg, 269 (85 per cent); 60-90, mm Hg, 17 (5 per cent).

Post-operative circulatory disturbances: 141-210, 5 (16 per cent); 91-140, 44 (16 per cent); 60-90, 4 (25 per cent).

Thus systolic pressure higher than usual was not reflected as a surgical handicap. Pressure below 90 was somewhat more dangerous.

Diastolic pressure: 91-130 mm Hg, 31 (10 per cent); 66-90, mm Hg, 251 (79 per cent); 30-65, mm Hg, 35 (11 per cent).

Post-operative circulatory disturbances: 91-130, 3 (19 per cent); 66-90, 39 (15 per cent); 30-65, 8 (23 per cent).

Again a moderate increase in trouble is indicated among the patients with low diastolic pressure.

Haemoglobin—Haemoglobin varied from 62-100. There were no very low readings in this series, the lowest being 62 per cent. They were divided into two groups: Haemoglobin 81-100, 282 (89 per cent); 60-80, 34 (11 per cent).

Post-operative disturbances were as follows: 81-100, 58 (20 per cent); 60-80, 13 (38 per cent).

These figures again indicate a noteworthy increase in the lower levels.

Anaesthetics used were: Gas in 33, and ether in 283.

Post-operative lung trouble showed for: Gas 12 per cent, and ether 14 per cent, an insignificant difference.

Operations were: Abdominal, 118; pelvic, 146; extremities (included thyroid and breast), 50; chest, 2. Duration of operations 5 to 90 minutes; average 40 minutes.

Shock was also studied, but without reaching definite conclusions.

In endeavoring to reduce our pre-operative examinations to an arithmetical figure, we made use of several formulae. The application of Moots' method showed: "Operable," 289, of which 5 died (2 per cent); "inoperable," 27, 2 died (7 per cent (one of these from surgical peritonitis). Not a very helpful classification.

We tried many homemade rules, such as "subtract 1 per cent from the general average for (1) bloodpressure above 150, (2) haemoglobin below 80, etc., but were unsuccessful in achieving any "rule of thumb" which covered the various factors and gave at all reasonable figures.

The clinical rating stood the best test, though here we gave too much weight to heart and not enough to lung abnormalities. For comparison they were grouped as follows: Over 75 per cent, 250, died 1.6 per cent, post-operative trouble 19 per cent; 51-75 per cent, 49, died 2 per cent, post-operative trouble 32 per cent; 0-50 per cent, 17, died 12 per cent, post-operative trouble 60 per cent.

CONCLUSION

1. Ordinary surgical procedures well done, exhaust but a small percentage of the vitality of the average patient.

2. Heart abnormalities (without heart failure), did not seriously increase the surgical risk.

3. Bronchitis and emphysema proved to increase notably post-operative dangers.

4. High blood pressure *per se* did not indicate increased danger, but low pressure increased the post-operative risk.

5. Low haemoglobin values added to the surgical risk.

6. Moot's rule was useless in our hands.

7. We were unable to devise any formula for indicating operative risk.

8. Clinical judgment based upon thorough examination was the best index to surgical and post-operative risks.